The Waianae Diet Program: A Culturally Sensitive, Community-Based Obesity and Clinical Intervention Program for the Native Hawaiian Population

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The Waianae Diet Program (WDP) is a community-based program designed at the Waianae Coast Comprehensive Health Center in response to the high rates of obesity and chronic disease among Native Hawaiians. Its foundation is a 3-week program of traditional Hawaiian diet and cultural teachings. It employs 8 innovations in clinical nutrition and health promotion theory: 1. Non-calorie restricted weight loss protocol, 2. Dietary clinical intervention, 3. Cultural sensitivity, 4. Transition diet, 5. Whole-person approach, 6. Group ohana (family) support, 7. Community intervention, and 8. Role modeling. It has demonstrated significant weight loss with no calorie restriction, improvement in blood pressure, serum glucose, and serum lipids. It appears to have wide acceptance in the Hawaiian community. More studies are warranted to determine the long-term effect of this program.

Introduction

The Waianae Diet Program (WDP)[1] has been a uniquely successful clinical and community-based health promotion program targeted at the Native Hawaiian population. The program was designed as an intervention to deal with disproportionately high rates of obesity, chronic disease and mortality among Native Hawaiians. With almost no funding initially, and with resources drawn from within a predominantly Native Hawaiian community and its private, non-profit community health center, the Waianae Coast Comprehensive Health Center (WCCHC), it has become one of the most successful health promotion programs in Hawaii.

Because of its success, Hawaii's Office of Hawaiian Affairs (OHA) now provides funding to support most of the WDP activities to stimulate the development of similar programs state-wide. In May 1993, it received the highest national award in the Distinguished Community Health Promotion Program, the "Secretary's Award for Excellence," from the U.S. Department of Health and Human Services.

This article describes the components of the program, its history and current status, the theories and practices implemented in the program that contribute to its success. It also describes the comprehensive nature of the program, including clinical and community-wide health promotion components.

The Waianae Coast Comprehensive Health Center, Waianae, Hawaii

Program

The Waianae Diet Program was designed as a culturally appropriate, community-based intervention with special consideration given to accessibility, reasonable cost and ability to be propagated and sustained in the community.

The primary intervention is a 3-week period of adhering to a strict, traditional Hawaiian diet under close medical monitoring. Evenings are spent dining together and attending education sessions. Education sessions include cultural teachings, nutrition education sessions and motivational presentations. Participants are encouraged to become role-models and thus have an impact on others. Follow-up sessions are designed so the participants will sustain the dietary changes encouraged in the program.

The selection of food consists of those foods eaten in Hawaii before the onset of Western influence: taro, a starchy root similar to potatoes, poi, a mashed form of taro, sweet potatoes, yams, breadfruit, greens (fern shoots and the leaves of taro, sweet potatoes and yams), fruit, seaweed, fish and chicken. All foods are served either raw or steamed in a manner that approximates ancient styles of cooking. The diet approximates that of the ancient Hawaiians which was estimated to contain less than 10% fat, 12% to 15% protein and 75% to 78% carbohydrate.[1] The program teaches not only the traditional Hawaiian diet but also a *transition diet* which provides modern food alternatives for those not previously accustomed to Hawaiian foods, so that the program may be continued as a part of the life style.

As of June 1993, 120 individuals have gone through the formal program in Waianae and hundreds of others have benefited by following the program and forming their own groups to learn and support each other on the diet. Since 1990, perhaps thousands of others have heard about the program through the WDP methodology of delivering the message or by reading the *Waianae Book of Hawaiian Health*. Still others have benefited by follow-

ing the program on an individual basis, through the WDP follow-up programs, and through word-of-mouth from graduates of the program. The program has been so well received that WCCHC has assisted the Hawaii Department of Health (DOH) and other communities on the islands of Kauai, Maui, and Hawaii to develop similar programs through community-based organizations such as Native Hawaiian Health System.

Rationale

Currently, Hawaii is being promoted as "The Health State" by the DOH. The tragic irony, however, is that in Hawaii, the healthiest state in the union from the standpoint of longevity, Native Hawaiians have the shortest life span among all the ethnic groups in Hawaii, and also among the shortest in the United States.[2] Pure Hawaiians have the highest mortality rate from cardiovascular disease[3], stroke, diabetes and cancer as compared to that in all other ethnic groups in the nation. Preliminary data on obesity suggest that Native Hawaiians have one of the highest prevalences of obesity in America, second only to that of Samoans.[4,5] As far back as 1960, studies have indicated high rates of mortality due to cardiovascular disease [6] and risk factors including diabetes,[6,7] hypertension[8,9,10] and obesity[10,11,12] among the Native Hawaiian population. However, no intervention programs for that special population were ever initiated prior to 1989.

Historical evidence suggests that prior to western contact and western diets, Native Hawaiians had little cardiovascular disease or obesity.[13,14] A major contributing factor to the sharp decline in the health of Hawaiians was the change in diet and lifestyle that ensued.

The Waianae Diet Program was designed in response to these disproportionately high rates of death and chronic disease among Native Hawaiians. Since all of the chronic diseases mentioned above are diet-related, it was decided that a program focusing on diet would be the most effective approach.

Background

The concept of the Waianae Diet Program was conceived by the principal author in mid-1987 at the Waianae Coast Comprehensive Health Center and developed together with members of the Waianae Coast Community Committee and WCCHC staff. It was based on the application of 8 main innovative concepts in clinical intervention, health education and health promotion theory. These 8 concepts to be described in greater detail later in this paper are:

1. Non-calorie-restricted obesity protocol
2. Dietary clinical intervention
3. Cultural sensitivity
4. Transition diet
5. Whole-person approach
6. Group *ohana* support
7. Community-wide intervention
8. Role modeling

The program was designed to provide a culturally sensitive, health-intervention program for Native Hawaiian people on the Waianae Coast based on a weight-loss and clinical-intervention protocol using the traditional Hawaiian diet. It was modeled after the healthy traditional diets of many other cultures: Asian, Mediterranean, and American Indian. The weight-loss protocol was based on an innovative non-calorie-restricted approach relying on the low energy density of traditional Hawaiian foods and other traditional foods. It also was targeted at a number of diseases and risk factors including heart disease, hypertension, diabetes and cancer. In addition, it was designed to be the nucleus of a community-wide health intervention program with some elements similar to successful intervention programs conducted in other states.

During the development of the WDP, another project based on a traditional Hawaiian diet using a different protocol was implemented on Molokai known as the Molokai Diet Study (MDS). Dr N. Emmett Aluli, president of a community organization called *Na Pu'uwai* and Dr Kekuni Blaisdell of the University of Hawaii collaborated with Dr William Connor of the University of Oregon in the conduct of this study. The MDS demonstrated the lipid-lowering effect of a 4-week isocaloric traditional Hawaiian diet on 10 Hawaiians who had hyperlipidemia.[15] MDS protocol did not allow participants to lose weight. The MDS proved to be a catalyst for the WDP and accelerated its development. The MDS made it clear that the use of traditional Hawaiian foods in a controlled setting could reverse hyperlipidemia and that the similar WDP concept could be viable.

One of the strengths of the WDP as a health promotion program lies in the structure of the WCCHC's community-based board. It provides for input from the community and the empowerment by the community to place resources behind problems from which the community itself suffers and wants to remedy. It also provides for some measure of cultural sensitivity.

In late 1987, consistent with the WCCHC's community-based philosophy, an advisory committee comprising Waianae Coast community members and health professionals of the extended Hawaiian communitywas formed to carry out the WDP. The advisory committee was one of the building blocks intended to support the community-wide program to promote good health. It provided a means by which the community would invest in the program and help ensure its success. Also, it was hoped that such an advisory committee would provide access to in-kind assistance and help raise funds for the program.

Claire Hughes MS, RD, Native Hawaiian nutritionist (Executive Director of the Governor's Health Promotion and Development Center at the time of her initial involvement), was a member of the planning committee from its earliest stages. Her history of promoting traditional Hawaiian foods for health in the Hawaiian community was a source of strength for the program. She helped ensure that the traditional Hawaiian menu was authentic and conformed to the Waianae Diet protocol. She was co-editor of the *Waianae Book of Hawaiian Health* and the most steadfast member of the committee. Her persistence and dedication was instrumental in the implementation of the WDP.

In late 1988, Helen O'Connor, the former coordinator of the MDS who was living on Oahu at the time, was asked to serve on

the Advisory Committee. Because of her experience with the Molokai Diet and her expertise in reaching communities, she was hired by the WCCHC as the coordinator of the WDP. She not only coordinated the WDP in its early years, but also subsequently assisted in the development of similar programs on the Neighbor Islands. Moreover, she brought a community health worker (CHW) model for outreach workers from the Indian Health Service which has since been turned into a certified program accredited through WCCHC and local community colleges.

Interest in the program was high as prospective candidates were being identified; however, despite numerous requests made to various organizations, funding was not available and the program could not proceed. Increasing demand and the needs of the largely Hawaiian community in Waianae motivated the board of WCCHC to allow the program to begin using the center's own resources.

In October 1989 the first 3-week Waianae Diet Program intervention project was held; it was supported almost entirely by the WCCHC with some help from Kahumana Farm and Community Center and the Honolulu Poi Company. It employed a number of important innovations in culturally sensitive disease intervention, education and promotion of good health.

Among the important clinical results was the finding of weight-loss without calorie restriction, improvement in blood lipid levels (confirming what was found in the MDS), and dramatic improvement in the control of diabetes. In addition, a number of other medical conditions seemed to be improved including arthritis, hypertension, acne and headaches.

The 8 Innovative Concepts of WDP

1. Obesity Intervention

One of the clinical innovations of the WDP is its approach to loss of weight. It is unique in 2 ways: First, the WDP offers a non-calorie-restricted diet that emphasizes the value of the food consumed in terms of its bulk and its low fat, low energy density nature rather than by limiting calories or size of the serving. This approach finds support in studies that have been conducted that show a low fat diet is associated with less obesity[30-32] and may produce weight-loss, [21-24] and studies that have shown the effect on weight loss of a non-calorie-restricted, low-energy-density (LED) diet.[25,26] The Waianae Diet is both low in fat content (less than 10%) and low in energy density (0.83 cal/gm).

Second, the WDP is unique in that it provides a diet program within the context of an ethnic culture. Whether offering it as Hawaiian food or as Japanese or other cultural/ethnic food in the transition diet, this cultural component helps ensure adherence and long-term maintenance of the diet.

The results of the program are consistent with its intent of inducing natural weight loss on a non-calorie-restricted diet. After 3 weeks of eating as much as they wanted, the 21 participants lost an average of 17.1 pounds. Caloric intake decreased about 40%; the satiety level remained high.[1] Long-term results are promising: Over a period of more than 5 years since participating in the program, at least 6 of the original 19 adults have maintained a significant reduction in their weight (8 pounds or more), an improvement over most weight loss programs.

2. Disease Intervention

A second clinical innovation in the Waianae Diet Program is the use of traditional diets of all cultures as an intervention for chronic disease. As indicated above, a number of studies indicate that traditional diets of other cultures are associated with low rates of obesity, cardiovascular risk, diabetes and cancer.[29-32] The WDP applies this information using the traditional Hawaiian diet as a model for nutrition as a primary intervention, and traditional foods of all cultures for maintenance of the dietary intervention. The following are some examples of improvement in clinical markers in participants suffering from various chronic illnesses (Table 1.).

Diabetes.—Perhaps the most striking effect of the diet was the control of blood sugar. In 6 groups of 20 participants, the control of blood sugar was found to be consistently better while the diabetic was on the Waianae diet. One of the participants who had been on 80 units of insulin no longer required any medication after 5 days, and 2 others who were on 60 units of insulin also no longer required medication after 2 to 3 weeks.

Serum glucose.—The decrease in fasting serum glucose was surprisingly large but consistent with similar programs elsewhere using high complex carbohydrate, high fiber diets in the management of diabetes.[35,36] The automatic decrease in calorie intake certainly played a role in the control. In addition, the low glycemic index and the low fat content of the food eaten very likely played an important role.

Serum lipids.—Total serum cholesterol levels decreased significantly, with an average decrease of 14.1%.[1] Initially there were 16 out of 19 participants with cholesterol levels over 200 mg/dl as compared to only 3 at the end of the program. The decrease in serum cholesterol could be attributed to the low fat, low cholesterol content[38,39] of the traditional Hawaiian diet which was about 7% to 12% fat.[1] Weight loss also might have played a part in lowering cholesterol, although moderate weight loss alone has not been known to necessarily induce a decrease in cholesterol.[40] There was a moderate decrease in LDL and a slight but insignificant decrease in HDL and a slight but insignificant reduction in Chol/HDL ratio.

The reduction in triglycerides was quite dramatic; it is consistent with other high carbohydrate diet studies,[35,36] but inconsistent with others that indicate that a high carbohydrate diet causes a rise in triglycerides.[37]

Blood pressure.—A number of studies indicate that dietary intervention in hypertension can be very effective. In the WDP, both systolic and diastolic blood pressures fell significantly. The average systolic blood pressure decreased 7.8% and the average diastolic pressure decreased 11.5%.

Cancer prevention.—The National Cancer Institute (NCI) estimates that approximately 35% of all cancers are diet-related. A number of nutrients have been implicated in the cause and prevention of various cancers. Dietary fat seems to be directly related to a number of cancers such as cancer of the breast, prostate and colon. Dietary fiber appears to protect against cancer of the colon; antioxidant vitamins such as beta-carotene and vitamin C appear to protect against a variety of cancers. Both the traditional Hawaiian diet and the transition diet provide an excellent way to encourage the consumption of low-fat, high-

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Other health conditions.—There have been reports from many of the participants of beneficial effects of the WDP. Individuals have reported improvement in arthritis, asthma, gastritis, fatigue, acne, headaches and impotence. Although such reports must be viewed with some reservation because they are anecdotal and could be attributable to the placebo effect, there is the possibility that the program did indeed cause these beneficial changes.

3. Culturally Sensitive Health Education

The WDP was designed not only as a clinical intervention modality but also to create change in health-related knowledge, attitudes and behaviors. One vehicle of change was the education sessions during each 21-day period. The participants' adherence to the program was high during its 21-day period[1], and the interest in the approach was widespread among the Hawaiian community that it served. One of the reasons for this high rate of success is the program's culturally sensitive approach. The purpose of teaching culture and teaching in a culturally appropriate way was to enhance learning and motivation, to change behavior by breaking down barriers and fostering enthusiasm for the messages in the program.[42] Health education and social science literature supported the value of this approach.

The traditional Hawaiian diet is the primary element designed to reflect culture sensitivity and is the focus of the nutrition-intervention and nutrition-education aspect of the program. The diet is presented as authentically as possible while still conforming to the WDP weight-loss and chronic disease intervention protocol. Only foods eaten by Native Hawaiians prior to western influence are used which provides an excellent opportunity to discuss and teach the history of Hawaii and the cultural ways of the Hawaiian people in the context of diet, life-style and health.

The foods themselves are useful cultural teaching tools. The traditional Hawaiian beliefs regarding food provide an opportunity to present Hawaiian history in the form of cultural teachings. For example *Kalo* (taro) in Hawaiian beliefs is the first born child of *Papa* (Mother Earth) and *Wakea* (Father Heaven) and is the eldest sibling of the human race.[16] Thus when the importance of taro in the diet is taught, the nutritional aspects of taro are presented along with the cultural aspects of the food. This provides for a more meaningful presentation and is more likely to be learned and internalized by the participants.

Cultural values are honored and taught by the *kupuna* (Hawaiian elders) and other teachers of Hawaiian culture together with the Health Education and Nutrition staff of the WCCHC so that messages are woven into the cultural teaching. Topics such as *la'au lapa'au* (Hawaiian herbal medicine) and *lomilomi* (Hawaiian massage) are covered. Such sessions also help improve access to medical care.[43] Four sessions, Monday to Thursday, are provided by cultural or health-related teachers after dinner. Subjects include modern nutrition, traditional foods, *kalo* farming, *ahupuaa* (division of land) systems, traditional healing and other cultural and health topics. Traditional Hawaiian practitioners teach classes on cultural healing practices. Friday is reserved for providing the inward maturing of the participants with gripe sessions and inspirational presentations. Saturday and Sunday are spent with their families.

Participants learn to greet each other in Hawaiian and use Hawaiian words at the project site whenever possible. This serves to honor the language, symbolically represents the restoration of the Hawaiian culture, and contributes to the restoration of the health of the Hawaiian people.

4. Transition Diet

Another unique practice by the WDP is the use of the transition diet. An additional advantage found in the use of traditional Hawaiian food is in the way it provides an effective mnemonic device we call a template. It is a model of a body of knowledge (in this case, a pattern of eating and life-style) that is already known to the participants and can be used to stimulate recall and motivation. This is to some extent based on the idea of looking at the audience not as a target but as a work force as described in Schwartz.[41] In this approach, the message is delivered in a way that recalls information already in the minds of the members of the audience and that can be mobilized to enhance the message. The WDP makes good use of this technique by using the traditional Hawaiian diet as a template for making food choices and substitutions with equivalent foods. Cooking techniques and other aspects of the diet coupled with personal behavior are learned easily in this manner.

5. The Whole-Person Concept

Traditional Hawaiian healing was practiced with the spirit of *Lokahi i ke Ola* or *Ola Lokahi*. In other words, they dealt with the whole person and that person's relationship to the universe. In keeping with this principle and to be sensitive to the culture, elements of spiritual, mental, emotional and physical aspects are included in the teachings.[16] Classes are taught with these elements in mind and special teachers cover these aspects of health. This allows for a broader range of personal and common motives to be discussed openly in order to develop and sustain the adherence to the program during and after the formal period. This approach also allows for the program to be more complete, enjoyable and memorable. For example, in addressing the physical aspect, exercise is presented as an important factor to complement any reputable nutrition or health program. Song and dance can be easily adapted to promoting exercise in an enjoyable manner that also promotes Hawaiian culture. The use of prayer is important to enhance the spiritual aspect for the participants. A class in *ho'oponopono* is useful in dealing with the emotional side of relationships between people, and classes on health deal with the mental aspect in these ways.

6. Family Concept

One of the most powerful tools of the Waianae Diet Program is the bonding that takes place in each group. While social support is an essential part of any diet program, the feeling of support generated in the WDP is extraordinary. The feeling of mutual support and camaraderie creates the essence of family or *ohana*. This provides a strong impetus for mutual support for the

participants to continue ongoing care. One of the principles of the health education component of the WDP is that learning takes place in a non-threatening, family-like group setting.

In addition to creating the essence of *ohana* in each group, the WDP encourages the participants to propagate change within his or her natural family. This is part of the program's purpose: To promote dietary change in a natural network of Hawaiians. This also builds social support that helps foster lasting change in their daily lives.[44] To emphasize the importance of families in the program, couples are especially welcomed because they can support each other, and children are welcome if both parents are accepted.

7. Community Intervention

Studies have been done demonstrating the effectiveness of community-wide health-promotion efforts in reducing cardiovascular risk factors in the late 1970s and 1980s at Stanford,[17] Pawtucket,[18] Minnesota,[19] and North Karelia.[20] The WDP is unique in that it not only incorporates a culturally sensitive educational message, it also employs many elements similar to those in these large intervention programs. The following are some of these elements:

Marketing theory.—The WDP was designed to propagate based on sound marketing principles. Such principles are at the core of successful community health promotion programs such as the program implemented in Pawtucket.[45] A key principle is that WDP was designed with the targeted market in mind. The question, "What does the Hawaiian community want?" was first asked in a context of assessment of needs. Because nutrition programs were high priorities of the Waianae community, the WDP was geared to respond to this wish. The messages in programming the WDP were then carefully designed to suit the demographics of the community and designed to expand easily not only through the WCCHC but also by word of mouth and by written materials (ie, the *Waianae Book of Hawaiian Health*).[16]

Networking with community organizations is very important for 2 main reasons. First, because of the resources required to complete a 21-day WDP and to provide for follow-up, it is important to have some in-kind assistance to the program. Second, networking also provides for a feeling of ownership in the program, which is important to long-term success both on an individual level and on a community-wide level.

The WDP can be described in the context of "diffusion of innovation" theory. It is intended to disseminate information and activities throughout the community, partly on the basis of the diffusion theory which describes the transmission of a new behavior from person to person.

Working with print and electronic media.—The WDP is an agent of change in the broader community and mass media is an important extension of this role. Thus, working with the media is an important part of the implementation of this program whether it is television, newspapers or the radio. Dr Shintani currently has a 2-hour radio talk show to help support dietary change and frequently features the Waianae Diet Program on the show. In addition, he writes an article in the OHA newspaper to provide information to the general public that is consistent with the goals of the WDP.

Fostering other community-based programs.—The WCCHC is a community-owned and operated center. The strength of the WDP lies in the WCCHC board of directors who are community members and users of the health center; they have a stake in the outcome of the program. This helps to ensure that the resources of the center are allocated to serve the best interests of the community. In keeping with this philosophy, it is important to the development of the program for each community to enlist its own team or staff from the community and, where possible, to work through a community-based group. For this reason, it is recommended that each community find a site coordinator for the project from within the community and then strongly network with other community organizations. In addition, if participants who have health problems are intended to be in the program, a physician who is committed to the program should be engaged as part of the team.

8. Role Models

Beyond the diffusion theory, the WDP introduces an additional element we loosely describe as the "propagation theory." The basic philosophy in this element of the WDP approach is that "everyone is a teacher and everyone is a student." Participants are viewed as agents of change; they are actively encouraged to be teachers and motivators through their words and their example. In a culturally sensitive smoking-cessation program, "*A Sus Salud*," a similar approach is used with great success in disseminating a health message through the media.

In most Hawaiian communities there are natural leaders to whom many people look for advice. These individuals are an important part of the team to help promulgate the message throughout the community. Such individuals were asked to fill some of the positions in the program because of their potential for influencing other members of the community.

Conclusion

As described above, the WDP has been effective in generating interest in diet and life-style change among members of a high-risk, hard-to-reach, special population—the Native Hawaiians. The 8 innovations in clinical and community health intervention appear to have made a difference in reaching this population. Short-term results are significant in reducing weight, blood pressure, serum lipids, and serum glucose.

Further studies on this multidisciplinary approach appear to be promising in the potential yield of information that will help in reaching any population in order to improve knowledge, attitudes and to health behavior, and sustain these changes over a long period of time. In addition, it has potentially far-reaching implications in the use of traditional Hawaiian foods and traditional foods of many cultures in the prevention and intervention of a variety of chronic diseases. Moreover, because this intervention is "low tech" it is relatively low in cost. Because it is not only preventive in nature but also an effective intervention, it could replace higher cost medical or surgical intervention in many

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➤ *(Continued from Page 141)*

cases and help alleviate our modern health-care crisis.

Table 1.—Waianae Diet Program Results

Mean change in risk factors after 21 days on a traditional Hawaiian diet without calorie restriction

Risk Factor	Begin	End	Change	% Change	p value*
Weight (pounds)	264.0	246.9	-17.1	-6.5	<.0001
Cholesterol (mg/dl)	222.3	191.1	-31.2	-14.1	<.001
HDL (mg/dl)	37.7	34.9	-2.8		NS
LDL (mg/dl)	147.2	130.0	-17.2	-11.2	<.02
C/H ratio	6.3	5.7	-0.6		NS
Triglycerides (mg/dl)	236.2	138.2	-98	-41.5	<.01
Glucose (mg/dl)	161.9	123.4	38.5	-23.8	<.01
Systolic pressure (mmHg)	133.6	122.1	-11.5	-8.6	<.01
Diastolic pressure (mmHg)	84.2	75.3	-8.9	-10.6	<.01

*p value based on a two-tailed "student's t" test.
n=19 excelpt for LDL where n=17 due to invalid values caused by high triglycerides.
Adapted from Shintani [1]

References

1. Shintani TT, Hughes CK, Beckham S, O'Connor HK. Obesity and cardiovascular risk intervention through the "ad libitum" feeding of traditional Hawaiian diet. *Am J Clin Nutr.* 1991;53:1647S-51S.
2. Gardner RW. *Life tables by ethnic group for Hawaii.* Honolulu, Hawaii: Research and Statistics Office; 1980. Hawaii Department of Health publication R&S Report;47.
3. *Current health status and population projections of Native Hawaiians living in Hawaii.* Washington DC: Office of Technology Assessment; April 1987. U.S. Congress.
4. Aluli NE. Prevalence of obesity in a Native Hawaiian population. *Am J Clin Nutr.* 1991;53:1556S-60S.
5. McGarvey ST. Obesity in Samoans and a perspective on its etiology in Polynesians. *Am J Clin Nutr.* 1991;53:1586S-94S.
6. Moellering RC, Bassett DR. Myocardial infarction in Hawaiian and Japanese males on Oahu–a review of 505 cases occurring between 1955 and 1964. *J Chron Dis.* 1967;20:89-101.
7. Sloan NR. Ethnic distribution of diabetes mellitus in Hawaii. *JAMA.* 1963;183:419-424.
8. Sloan NR. Diabetes in Hawaii. *Hawaii Med J.* 1959;18:485-487.
9. Bassett DR, Abel MA, Moellering RC, et al. Dietary intake, smoking history, energy balance, and "stress" in relation to age, and to coronary heart disease risk in Hawaiian and Japanese men in Hawaii. *Am J Clin Nutr.* 1969;22:1504-20.
10. Bassett DR, Moellering RC, Rosenblatt G, et al. Coronary heart disease in Hawaii: Serum lipids, and cardiovascular, anthropometric, and related findings in Japanese and Hawaiian men. *J Chron Dis.* 1969;21:565-583.
11. Young F, Lichton IJ, Hamilton RM, Dorrough SAL, Alford EJ, et al. Body weight, blood pressure, and electrolyte excretion of young adults from six ethnic groups in Hawaii. *Am J Clin Nutr.* 1987;45:126-30.
12. Morioka HM, Brown ML. Incidence of obesity and overweight among Honolulu police and firemen. *Public Health Report.* 1970;85:433-440.
13. Miller CD. The influence of foods and food habits upon the stature and teeth of the ancient Hawaiians. In: Snow CE. *Early Hawaiians.* Lexington, Ky: University of Kentucky Press; 1974:167-75.
14. Blaisdell RK, Ikeda I, ed. Historical and cultural aspects of native Hawaiian health in social process in Hawaii. Honolulu, Hawaii: University of Hawaii Press; 1989:1-21.
15. Connor W, Blaisdell RK, Curb D, Aluli NE, Kohn C, Executive Committee of the Moloka'i Heart Study. The anti coronary heart disease effects of the Native Hawaiian diet a metabolic study of dietary change and plasma lipids. (Unpublished manuscript, 1989).
16. Shintani TT, Hughes CK. *The Waianae Book of Hawaiian Health.* Waianae, Hawaii: Waianae Coast Comprehensive Health Center; 1991.
17. Meyer AJ, et al. Skills training in a cardiovascular health education campaign. *J Consult Clin Psych.* 1980;48:2:129-42.
18. Carleton RA, Lasater TM, Assaf A, et al. The Pawtucket Heart Health Program: An experiment in population-based disease prevention. *Rhode Island Med J.* 1987;70:533-8.
19. Jacobs DR, Luepker RV, Mittelmark MB. Community-wide prevention strategies: evaluation design of the Minnesota heart health program. *J Chron Dis.* 1986;39:10:775-788.
20. Nissinen A, Tuomilehto J, Pekka P. From pilot project to national implementation: experiences from the North Karelia project. *Scand J Prim Health Care*. 1988;(suppl) 49-56.
21. Whittemore AS, Wu-Williams AH, Lee M, et al. Diet, physical activity, and colorectal cancer among Chinese in North America and China. *J Natl Cancer Inst.* 1990;82:11:915-26.
22. Buzzard IM, Asp EH, Chlebowski RT, et al. Diet intervention methods to reduce fat intake: Nutrient and food group composition of self-selected low-fat diets. *J Am Diet Assoc.* 1990;90:1:42-53.
23. Salmon DMW, Flatt JP. Effect of dietary fat content on the incidence of obesity among ad libitum fed mice. *Intl J Obesity.* 1985;9:443-449.
24. Romieu I, Willett, WC, Stampfer, MJ, et al. Energy intake and other determinants of relative weight. *Am J Clin Nutr.* 1988;47:406-12.
25. Weinsier RL, Bacon JA, Birch R. Time-calorie displacement diet for weight control: A prospective evaluation of its adequacy for maintaining normal nutritional status. *Int J Obes.* 1983;7:538-48.
26. Weinsier RL, Johnston MH, Doleys DM, Bacon JA. Dietary management of obesity: evaluation of the time-energy displacement diet in terms of its efficacy and nutritional adequacy for long-term weight control. *Br J Nutr.* 1982;4367-379.
27. Duncan KH, Bacon JA, Weinsier RL. The effects of high and low energy density diets on satiety, energy intake, and eating time of obese and nonobese subjects. *Am J Clin Nutr.* May 1983;37:763-767.
28. Lissner LL, Strupp DA, Kawlwarf HJ, et al. Dietary fat intake and the regulation of energy intake in human subjects. *Am J Clin Nutr.* 1987;46:886-92.
29. Trowell H, Burkitt, D eds. *Western Diseases: Their emergence and prevention.* Harvard University Press, Cambridge MA, 1981.
30. Young TK, Sevenhuysen G. Obesity in northern Canadian Indians: patterns, determinants, and consequences. *Am J Clin Nutr.* 1989;49:786-93.
31. McMurry MP, Connor WE, Cerqueira MT. Dietary cholesterol and the plasma lipids and lipoproteins in the Tarahumara Indians: a people habituated to a low cholesterol diet after weaning. *Am J Clin Nutr.* 1982;35:741-4.
32. Sacks FM, Castelli WP, Donner A, Kass EH. Plasma lipids and lipoproteins in vegetarians and controls. *N Engl J Med.* 1975;292:1148-55.
33. West KM. Diabetes in American Indians and other native populations of the new world. *Diabetes.* 1974;23:841-855.
34. Taylor RJ, Zimmet PZ. Obesity and diabetes in Western Samoa. *Int J Obes.* 1981;5:367-376.
35. Anderson JW. Hypolipidemic effects of high-carbohydrate high-fiber diets. *Metabolism.* 1980;29:551-558.
36. Andersen E, Hellstrom P, et al. Effects of a rice-rich versus a potato-rich diet on glucose, lipoprotein, and cholesterol metabolism in noninsulin-dependent diabetics. *Am J Clin Nutr.* 1984;39:598-606.
37. Farquhar JW, Frank A, Gross RC, Reaven GM. Glucose, insulin, and triglyceride responses to high and low carbohydrate diets in man. *J Clin Invest.* 1966;45:1648-1656.
38. Chima CS, Miller-Kovach K, et al. Lipid management clinic: Dietary intervention for patients with hypercholesterolemia. *J Am Diet Assoc.* 1990;90:272-274.
39. Connor WE, Connor SL. The dietary treatment of hyperlipidemia: rationale, technique, and efficacy. *Med Clin North Am.* 1982;66:485-518.
40. Kempner W, Newborg BD, Peschel RL, Skyler JS. Treatment of massive obesity with rice/reduction diet program. *Arch Int Med.* 1975;135:1575-84.
41. Schwartz, T. *The responsive chord.* Garden City, NY: Anchor Press/Doubleday; 1974.
42. LeFebvre RC, Lasater RA, Carleton RA, Petersson G. Theory and delivery of health programming in the community: the Pawtucket heart health program. *Prev Med.* 1987;16:80-95.
43. Mokuau N. The impoverishment of Native Hawaiians and the social work challenge. *Health SocWork.* 1990;15;3:235-42.
44. Snyder P. Health service implications of folk healing among older Asian Americans and Hawaiians in Honolulu. *Gerontologist.* 1984;24:5:471-476.
45. Crooks CE, Iammarino NK, Weinberg AD. The family's role in health promotion. *Health Values.* 1987;11:2.